AUTHORS:     Danilkin, I. S.,  Rabinovich, M. S.              57-27-7-18/40

TITLE:       Resonance-Variations of the Synchrotron Oscillations in
             Accelerators of Charged Particles (Rezonansnyye
             vozmushcheniya sinkhrotronnykh kolebaniy v uskoritelyakh
             zaryazhennykh chastits).

PERIODICAL:  Zhurnal Tekhnicheskoy Fiziki, 1957, Vol. 27, Nr 7,
             pp. 1558-1570 (USSR)

ABSTRACT:    It is the object of this investigation to estimate the
             possible losses of particles in accelerators of a synchro-
             phasotron-type in the presence of resonance-variations of
             the radial-phase-oscillations. In a purely formal manner it
             is determined which of the characteristics of the varying
             phase-motion are necessary for this. The phase-motion
             of the particles in the presence of an external harmonic
             excitation is investigated. Based on this investigation the
             knowledge concerning the character of the resonance-
             variation is deepened and the possibility is given to give
             an answer to the question of the amount of amplitude-
             variations at least in the domain where an asymptotic
Card 1/2     solution (as long as the amplitude of the synchrotron-

Resonance-Variations of the Synchrotron Oscillations in     57-27-7-18/40
Accelerators of Charged Particles

oscillations is not very large) is applicable. In order
to be able to use the obtained results for the estimation
of the losses of particles, the relation between the radial
and the phase-deviations during the synchrotron-
oscillations is determined. A comparison is made between
the theory and the experiments made with the synchro-
phasotron for 10 billion eV.
There are 4 figures and 5 references, all of which are
Slavic.

ASSOCIATION: Institute for Physics AS USSR imeni P. N. Lebelev, Moscow
(Fizicheskiy institut im. P. N. Lebedeva AN SSSR Moskva)

SUBMITTED:   January 28, 1957

AVAILABLE:   Library of Congress

1.  Particle accelerators-Equipment   2.  Synchrotrons-Particle losses-
Card 2/2       Estimation   3.  Synchrotrons-Effects of resonance variations

*RABINOVICH  M.S.*

*P.3*

PHASE I BOOK EXPLOITATION                SOV/3851
                                         SOV/5-M-10

Akademiya nauk SSSR.  Fizicheskiy institut imeni P.N. Lebedeva

Trudy, tom. 10  (Transactions of the Physics Institute, Academy of Sciences USSR,
    Vol 10)  Moscow, 1958.  175 p.  Errata slip inserted.  3,000 copies printed.

Resp.Ed.:  D.V. Skobel'tsyn, Academician.

PURPOSE:  This book is intended for physicists engaged in hydrodynamic research
    or nuclear accelerator (synchrophasotron) theory.

COVERAGE:  This is a collection of articles dedicated to the memory of Semen
    Zakharovich Belen'kiy and contains two of his articles on supersonic flow
    and hydrodynamics which have not been published previously. The third article
    is by M.S. Rabinovich on the mechanical and mathematical theory of nuclear
    particle acceleration in a 10-Bev proton synchrotron having a four-sectored
    magnet with 8 m rectilinear gaps separating the sectors.  In chapter 1, the
    author presents a new criterion for the stability of phase oscillations in
    the rectilinear gaps.  He states that his work in 1949 with A.M. Baldin and
    V.V. Mikhaylov on the effects of deviations of a magnetic field from the
Card 1/6

Transactions of the Physics Institute (Cont.)                SOV/3851

theoretical (chapter III) and his investigation of fast oscillations of
particles, taking into account magnetic field variations and particle
energy increases, (chapter II) are the only studies on these problems to date.
The author thanks V.I. Veksler who directed the installation of the accelerator.
There are 58 references: 46 Soviet and 12 English.

TABLE OF CONTENTS:

Card 2/6

·ı

Transactions of the Physics Institute (Cont.)                    SOV/3851

Card 3/6

HIGH-ENERGY NUCLEAR PHYSICS: PARTICLE ACCELERATORS (SYNCHROTRONS)


"The Atainable Frequency Ratio in Synchrotons," by Ye. M. Moroz and
M.S. Rabinovich. Atomnaya Energiya, No2, February 1958, pp 128-131.


An investigation of the energy dependence of the amplitude of syn-
chroton oscillations caused by fluctuations in the radiation. A simple
stationary solution is obtained for the phase equation, applicable
with sufficient practical accuracy to all large synchrotons. It is
shown that when electrons are accelerated to energies of several Bev,
the value of the maximum attainable frequency is strictly limitted, and
dependes on the limited amplitude of the accelerating voltage.

*Rabinovich, M S*

AUTHORS:     Moroz, Ye. M., Rabinovich, M. S.                    89-2-2/35

TITLE:       The **Admissible** Frequency Ratio in Synchrotrons (O dopustimoy krat=
             nost chastoty v sinkhrotronakh).

PERIODICAL:  Atomnaya Energiya, 1958,      ,  Nr 2, pp. 128 - 131 (USSR).

ABSTRACT:    The energy dependence of the amplitudes of the synchrotron oscilla=
             tions is investigated theoretically, which are caused by the fluc=
             tuation of radiation. A simple steady solution of the phase equation
             is deduced, which may be applied with an accuracy sufficient for
             practical purposes even to arbitrarily large synchrotrons. It was
             possible to show, that on an acceleration of electrons up to the
             range of BeV's, the value of the maximum admissible frequency multi=
             plication possesses a clear limit. It is determined by the limiting
             amplitude of the accelerating voltage.
             There are 5 references, 3 of which are Slavic.

SUBMITTED:   July 17, 1957.

AVAILABLE:   Library of Congress.

Card 1/1     1. **Synchrotrons-Design**     2. **Synchrotrons-Analysis**

AUTHORS:        Askar'yan, G. A., Rabinovich, M. S.       SOV/89-5-6-7/25

TITLE:          A Resonance Method of Localizing and Heating the Plasma by
                Variable Electromagnetic Pressure (Rezonansnyy sposob
                lokalizatsii i nagreva plazmy peremennym elektromagnitnym
                davleniyem)

PERIODICAL:     Atomnaya energiya, 1958, Vol 5, Nr 6, pp 643-644   (USSR)

ABSTRACT:       The resonance-like excitation of the volume oscillations
                of plasma accumulation is to be carried out by means of an
                amplitude-modulating electromagnetic field. In this way
                a pulsed and uniformly distributed pressure is brought to
                bear upon the plasma surface. A modulated isotropic pressure
                acting upon a quasispherical plasma-compression can be
                realized in the following manner:
                a) Shortwave radiation modulated with respect to intensity,
                b) Modulation of a rapidly moving magnetic field,
                c) Superposition of three rapidly varying magnetic fields, etc.
                The average pressure $\bar{P}$ (t) acting upon the plasma surface
                is given by:
                $$\bar{P}(t) \approx \frac{\bar{H}^2(t)}{8\pi}$$

Card 1/5

A Resonance Method of Localizing and Heating the          SOV/89-5-6-7/2

Plasma by Variable Electromagnetic Pressure

(H = field strength on the surface of the plasma; averaging
is carried out according to a high-frequency cycle).
The excitation of the volume oscillations is then carried out
quickly and effectively if the effective modulation frequency
of the quasiacoustic resonance frequency corresponds to the
radial oscillation of the compression $\nu_{res}$ . The latter is
given by:

$$\nu_{res} \approx \frac{u}{2a_o} \sim \frac{1}{a_o} \sqrt{\frac{\mathcal{E}_T}{A}} \quad \text{megacycles}$$

$\mathcal{E}_T$ = thermal kinetic energy of the plasma ions, A = atomic
weight of the ions, $a_o$ = radius of accumulation.

If it is assumed that in oscillations the principal mass of
the plasma takes part at the same time, the following equation
is obtained for the excitation of plasma-oscillations (written
down in dimensionless form):

Card 2/5

A Resonance Method of Localizing and Heating the          SOV/89-5-6-7/25
Plasma by Variable Electromagnetic Pressure

$$\frac{1}{\left(\frac{a(t)}{a_o}\right)^2} \cdot \frac{d^2\left(\frac{a(t)}{a_o}\right)}{d(\sim \mathcal{V}_{res} \cdot t)^2} = \frac{1}{\left(\frac{a(t)}{a_o}\right)^3 \cdot \gamma} - \frac{P_{ext}}{P_o} \cdot (\mathcal{T})$$

This equation can be solved numerically for various

modulation functions $\dfrac{P_{ext}}{P_o}(\mathcal{T})$

The amount of the coefficient of pressure transformation
(ratio between the maximum pressure used $P_{ext}$ and the
maximum attainable internal pressure $P_{max}$ in the dense
plasma) may be estimated at

$$K_p = \frac{P_{max}}{P_{ext}} = (\gamma - 1)\frac{\left(K_V - 1\right)}{\left(1 - \frac{1}{K_V^{\gamma-1}}\right)}$$

Card 3/5

A Resonance Method of Localizing and Heating the          SOV/89-5-6-7/25
Plasma by Variable Electromagnetic Pressure

Here $K_V = \dfrac{V_{max}}{V_{min}}$ ;   V = volume of accumulation, $\gamma$ = ratio

of the specific heat of the plasma gas.

It must be pointed out that in pulsed dynamic operation the stability conditions for the formation of plasma are different than in the case of steady operation.

Furthermore, it must be mentioned that if a plasma is heated to a high temperature the sudden action of an electromotive force upon the electrons of a quasineutral plasma causes intense radial oscillation of the ions. This is manifested by the fact that ions pass one another at high velocities near the center. This manner of exciting an ion oscillation by means of a "superhigh" temperature is an analogue to the production of "boltanki" (boltanki) of charged particles in a constant electric field.

Card 4/5

A Resonance Method of Localizing and Heating the     SOV/89-5-6-7/25
Plasma by Variable Electromagnetic Pressure

SUBMITTED:     August 5, 1958

Card 5/5

SOV/58-59-10-21877

Translation from:  Referativnyy Zhurnal, Fizika, 1959, Nr. 10, p 21 (USSR)

AUTHOR:       Rabinovich, M.S.

TITLE:        Foundations of Proton-Synchrotron Theory

PERIODICAL:   Tr. Fiz. in-ta. AN SSSR, 1958, Vol 10, pp 23 - 173

ABSTRACT:     This monograph, based on the author's studies from 1948 to 1950, is
              devoted to the theory of the split-magnet proton synchrotron. Special
              attention is paid to the applied aspect of the question. The theory
              is reduced to a form that it is convenient to use when practical ends
              are envisaged. The study contains 6 chapters. Ch.I investigates the
              characteristics of slow (radial-phase) oscillations of particles in a
              split-magnet accelerator. The formulae obtained in this connection
              have a great significance for the theory of injection, resonances, and
              so forth. The process of acceleration at multiple resonance is dis-
              cussed. Ch. II is devoted to fast (betatron) oscillations of particles.
              Allowance is made for the effect of rectilinear gaps on injection and on
              particle capture under accelerating conditions; the optimum angle of
              emergence of particles from the injector is determined; and the concept

Card 1/2

Foundations of Proton-Synchrotron Theory

SOV/58-59-10-21877

of envelopes of the particle's trajectory is introduced, permitting a simple and graphic description of the behavior of particles in the accelerator. For the first time a computation of the motion of particles is carried out with allowance for the magnetic field in rectilinear gaps. Ch. III investigates the effect of the deviations of the magnetic field from the calculated one. Ch. IV discusses resonance phenomena between fast and slow oscillations. A special technique is worked out for calculating resonances in a split-magnet accelerator with a great degree of accuracy. The resonances of the high-frequency harmonics of a magnetic field with phase oscillations are studied. Ch. V develops injection theory. Ch. VI, based on studies completed in 1953, gives a short account of the physical bases of strong focusing accelerators. The basic con- clusions of the theory are illustrated with a 10-BeV proton synchrotron as an example.

A.P. Fateyev

Card 2/2

RABINOVICH, M S

AUTHORS:      Danilkin, I. S. , Rabinovich, M. S.          57-2-23/32

TITLE:        The Capture of Particles in a Synchrophasotronic Regime of
              Acceleration (Zakhvat chastits v sinkhrofazotronnyy rezhim
              uskoreniya)

PERIODICAL:   Zhurnal Tekhnicheskoy Fiziki, 1958, Vol. 28, Nr 2, pp.351-364
              (USSR)

ABSTRACT:     The present paper gives several methods of the theoretical in-
              vestigation and the results of it obtained by way of experi-
              ment on the peculiarities of the capture of particles in a
              synchrophasotron under acceleration in an apparatus with ordi-
              nary focusing. With reference to the injection method usually
              employed in synchrophasotrons, in which the capture of partic-
              les takes place in 2 stages, the problem of the determination
              of quantities of the captured particles in a  synchrophasotron
              under acceleration is here divided into two parts: 1.) Calcu-
              lation of the capture-coefficient (with regard to the portion
              of captured particles) under a quasibetatronic way of opera-
Card 1/4      tion, and 2.) calculation of the capture-coefficient under

57-2-23/32

The Capture of Particles in a Synchrophasetronic Regime   of   Acceleration

the transition method of operation. In the first stage the smallness of the current intensities and the high energy of the particles injected into the acceleration-chamber of the synchrophasotron represent an important moment which permits to disregard all collective interactions between the particles. It is assumed that under a normal method of operation of the accelerator such injection conditions exist that vertical vibrations of the particles are few and that a collision with the horizontal chamber-walls during capture does not occur. A reduced variant for the calculation of the characteristics of the first stage is worked out. Although these reductions are attained at the expense of a considerable decrease in the accuracy of calculation, the suggested method (reference 2) nevertheless gives the possibility of taking into account in a qualitatively correct manner the dependence of $\eta_i$ and $\psi$ (A) (coefficient of capture in the first stage and the function of the distribution of free vibrations at the end of the first stage according to the amplitudes) on the different parameters of the accelerator and thus correctly to select their optimum values and tolerances. - In the calculation of the capture of particles in the transition method of operation (second stage) it is shown that all those particles are

Card 2/4

57-2-23/32

The Capture of Particles in a Synchrophasotronic Regi        of Acceleration

captured here whose initial conditions are represented by the inner points of the domain of phase-stability (limited by the separatrissa according to equation (12a)). The approximate value of the coefficient of capture in the second stage $\eta_2$ and of the coefficient of total capture $\eta = \eta_1 + \eta_2$ is calculated. It is shown that the assumption that the injected particle beam is monoenergetic is unessential. The methods of calculation given here were employed in the apparatus of the Institute for Physics AN USSR (erected together with the Scientific Research Institute for Electrophysical Apparatus MEP USSR and the Laboratory for Radio-Engineering AN USSR as a model of the 10 billion eV - synchrophasotron). The fundamental parameters of this apparatus are given. The peculiarity of the test apparatus was an essential dependence of the magnetic field indicator on the radius. The comparison of the theoretical and experimental data for the first stage showed a sufficient accuracy of the methods of calculation given here. Such a comparison for the second stage showed a good agreement except of $\eta_2(\varphi_{ot})$. The method given here permits to perform the calculations with an accuracy up to the order

Card 3/4

57-2-23/32

The Capture of Particles in a Synchrophasotronic Regime of    Acceleration

of magnitude of 30 + 40 % which is entirely sufficient for the projecting of an accelerator. There are 6 figures, and 5 references, all of which are Slavic.

ASSOCIATION:    Institute of Physics AS USSR imeni P. N. Lebedev, Moscow (Fizicheskiy institut AN SSSR im. P. N. Lebedeva,Moskva)

SUBMITTED:    August 7, 1956

AVAILABLE:    Library of Congress

1. Particles-Capture-Theory

Card 4/4

21(9)

AUTHORS:       Iogansen, L. V., Rabinovich, M. S.           SOV/56-35-4-31/

TITLE:         Coherent Radiation of Electrons in the Synchrotron.I
               (Kogerentnoye izlucheniye elektronov v sinkhrotrone .I)

ABSTRACT:      In a 100 MeV-synchrotron the electrons radiate within
               a wide frequency range: From radiofrequencies with
               wave lengths of the order of the trajectory length
               up to ultraviolet- or also X-ray radiation. Within
               the range: $\lambda \gg$ average distance between the electrons
               in the bunch radiation is partly coherent. Coherent
               radiation in the synchrotron depends above all on
               the phase vibrations of the electrons. Basic ex-
               perimental investigations of coherent radiation were
               carried out by A.M.Prokhorov on a 5 MeV synchrotron
               (Refs 1,2).Rytov ( FIAN-report, 1950) investigated
               coherent radiation on the assumption that all
Card 1/4       particles in the bunch perform phase oscillations with

Coherent Radiation of Electrons in the Synchrotron.I      SOV/5C-35-4-31/52

one and the same amplitude. The problem of
coherent radiation of the bunch in the case of any
frequency distribution with respect to phase
oscillations has hitherto not been investigated. A
detailed investigation of physical processes and
particle losses during the time of acceleration is
therefore of interest. The authors first investigated
the case of a single (relativistic) electron re-
volving on a circular orbit ($r_0$) with the angle
velocity $\omega_0$ and performing small harmonic phase
vibrations ($\Omega \ll \omega_0$). It holds that $\psi = \phi \sin \Omega t$, where
$\phi$ denotes the amplitude of phase vibrations. The
potentials of the harmonics and the electron field
(Fourier (Fur'ye)) is given, and the distribution
of particles with respect to phase vibrations
is investigated (Liuville), as well as the case
of a steady distribution: Distribution density
$w(\psi, \dot{\psi}, t) \equiv w(\phi)$. The true distribution in the bunch
has hitherto been but little investigated. From ex-
perimental amplitude distribution curves for the

Card 2/4

Coherent Radiation of Electrons in the Synchrotron.I    SOV/56-35-4-31/52

synchrotron of the FIAN SSSR (Physics Institute
AS USSR) at 250 MeV (Ref 4) data are, however, taken for
$\psi(\psi)$ and $f(\phi)$. Finally, the authors investigate
the range of wave length, for which radiation is
coherent, by means of the form factor for steady
distribution, and in the last paragraph non-steady
distribution is investigated. The expression derived
in this paper by means of the potential of a single-phase
modulated electron and of the distribution function
of the particles in the bunch for the spectrum of the
radiation field potential of the bunch is valid for
sufficiently low harmonics for which the radiation
is coherent. In conclusion the authors thank  A.M.
Prokhorov and Yu.M.Ado for valuable discussions and
for disclosing experimental data before their publication.
There are 4 Soviet references.

Card 3/4

Coherent Radiation of Electrons in the Synchrotron.I      SOV/56-35-4-31/52

ASSOCIATION:   Fizicheskiy institut im. P.N.Lebedeva Akademii nauk SSSR
               (Physics Institute imeni P.N.Lebedev of the Academy of
               Sciences USSR), Moskovskiy gosudarstvennyy pedagogicheskiy
               institut (Moscow Pedagogical State Institute)

SUBMITTED:     May 21, 1958

Card 4/4

66591

SOV/26-59-8-8/51

-21(9)-  21. 1000

AUTHORS:     Kolomenskiy, A.A., and Rabinovich, M.S., Doctors of Physical
             and Mathematical Sciences

TITLE:       The  Synchrophasotron — the Largest Accelerator in the World

PERIODICAL:  Priroda, 1959, Nr 8, pp 57-61 (USSR)

ABSTRACT:    For the construction of a synchrophasotron with a capacity
             of 10 billion electron volts, the following scientists were
             awarded the Lenin Prize in 1959: V.I. Veksler, L.P. Zinov'-
             yev, D.V. Yefremov, Ye.G. Komar, N.A. Monoszon, A.M. Stolov,
             A.L. Mints, F.A. Vodop'yanov, S.M. Rubchinskiy, A.A. Kolomen-
             skiy, V.A. Petukhov, and M.S. Rabinovich. On the principle of
             self-phasing of particles discovered by V.I. Veksler in 1944,
             new accelerators of the type phasotron, synchrotron, and synchro-
             phasotron have been installed. In April 1957, a synchrophaso-
             tron was put in operation at Dubna, capable of reaching 10 bill-
             ion electron volts. The research work on this apparatus has ··
Card 1/4     been carried out in the FIAN, Fizicheskiy institute im. P.N. Le-

66591

SOV/26-59-8-8/51

## The  Synchrophasotron — the  Largest  Accelerator  in  the  World

bedeva Akademii Nauk SSSR (Institute of Physics imeni P.N.
Lebedev at the AS of the USSR).  Even during 1953-1955, a
synchrophasotron of 180 million electron volts was under
construction in cooperation with the Radiotekhnicheskiy
institut AN SSSR (Radiotechnical Institute at the AS of the
USSR).  The installation of the synchrophasotron at Dubna
was performed by the OIYaI, Ob"yedinennyy institut yadernykh
issledovaniy ( Joint    Institute of Nuclear Research).
Scientists of 12 countries took part in the installation of
the apparatus.  The electromagnet of the synchrophasotron
consists of four circular sections, their radius is 28 m.
The magnet ring of the accelerator, with a weight of 36,000
tons, rests on a concrete base weighing 15,000 tons.  The
electrical substation which feeds the electromagnet, con-
sists of four units, the maximum capacity of which amounts
to more than 140,000 kw, i.e. more than double the capacity
of the Volkhovskaya GES (Volkhov GES).  In the second half of
Card 2/4     1958, the workers of the Laboratoriya vysokikh energiy OIYaI

66591
SOV/26-59-8-8/51

The Synchrophasotron — the Largest Accelerator in the World

(Laboratory of High Energies of the OIYaI) succeeded in increasing the intensity of the accelerated beam of protons by 10,000 times. Under the guidance of physicists **Wang Ken-ch'ang** (People's Rep. of China) and M.I. Solov' yev, a big propane chamber was installed which reveals the paths of the rapidly moving sub-atomic particles by the bubbles of the gas. A liquid-hydrogen chamber will facilitate research of the heavy K-mesons. New information on the synchrophasotron has been obtained from the Mezhdunarodnaya konferentsiya po fizike chastits vysokikh energiy (International Conference on the Physics of Particles of High-Energies) which was held at Kiyev in July 1959. Under the guidance of V.V. Vladimirskiy, a big accelerator of protons of 50-60 billion electron volts will be installed utilizing the principle of heavy focusing. The authors also mention that a model of a new cyclotron with approximately 1,000 times higher intensity has been given to the OIYaI by the scientists V.P. Dmitriyevskiy, V.P. Dzhele-pov, and V.I. Zomolodchikov. Today intensive research work is

Card 3/4

66591

SOV/26-59-8-8/51

The  Synchrophasotron — the  Largest  Accelerator  in  the  World

carried on to develop new methods of acceleration of particles
which are based on entirely different principles and, according
to the author, will provide for the utilization of plasma.
The diagram showing a synchrophasotron has been taken from the
pamphlet "V Dubne pod Moskvoy" (At Dubna near Moscow) by P.I.
Kapyrin and O.S. Sergeyev. There is 1 diagram and 4 Soviet
references.

ASSOCIATION:  Fizicheskiy institut im. P.N. Lebedeva Akademii nauk SSSR/
Moskva (Institute of Physics imeni P.N. Lebedev at the AS
of the USSR/ Moscow)

Card 4/4

MOROZ, Ye.M.; RABINOVICH, M.S.

Damping of synchrotron oscillations. Zhur.tekh.fiz. 29
no.2:269-271 F '59.                                      (MIRA 12:4)

1. Fizicheskiy institut im. P.N.Lebedeva AN SSSR, Moskva.
          (Synchrotron)        (Particles, Elementary)

.21(9)                                        SOV/56-37-1-18/64
AUTHORS:      Iogansen, L. V., Rabinovich, M. S.

TITLE:        Coherent Electron Radiation in a Synchrotron. II
              (Kogerentnoye izlucheniye elektronov v sinkhrotrone. II)

PERIODICAL:   Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959,
              Vol 37, Nr 1(7), pp 118-124 (USSR)

ABSTRACT:     The authors investigated the electromagnetic interaction of
              electrons in a thin relativistic bunch under coherent radiation
              in a synchrotron. In the present paper, it is assumed that
              all particles in the bunch move on coaxial circles at the
              same linear velocity $v \sim c$. Therefore, the betatron vibrations
              are neglected, and also the instantaneous deviations of the
              energies of the particles are not considered. This is also
              justified because in practice the density of the bunch in the
              synchrontron is much lower than its length. Therefore, the
              transverse dimensions of the bunch in the first approximation
              do not enter the expressions for the tangential forces determin-
              ed in the present paper. Also the interaction of the bunch
              with the chamber walls, with the poles of the magnet, and

Card 1/3

Coherent Electron Radiation in a Synchrotron. II

SOV/56-37-1-18/64

with the other building elements of real accelerators is not considered, and it is assumed that the electrons move in the unlimited free space. In the 4 parts of the present paper, the following factors are calculated: The interaction between 2 charges in the bunch, the action of the bunch on a single electron, the forces for some bunch models, and finally the short-range interaction. The authors thank Academician I. Ye. Tamm for the communication of results of a paper not yet published (Ref 4). There are 1 figure and 6 references, 3 of which are Soviet.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Institute of Physics imeni P. N. Lebedev of the Academy of Sciences, USSR).
Moskovskiy gosudarstvennyy pedagogicheskiy institut im. V. I. Lenina ( Moscow State Pedagogical Institute imeni V. I. Lenin)

Card 2/3

GINZBURG, Vitaliy Lazarevich; LEVIN, Lev Mikhaylovich; RABINOVICH, Matvey
    Samsonovich; SIVUKHIN, Dmitriy Vasil'yevich; CHETVERIKOVA,
    Yelizaveta Sergeyevna; LIVSHITS, B.L., red.; GAVRILOV, S.S.,
    tekhn.red.

    [Collection of problems for the general course in physics] Sbornik
    zadach po obshchemu kursu fiziki. Pod red. D.V.Sivukhina. Izd. 2.,
    perer. i dop.  Moskva, Gos.izd-vo fiziko-matem.lit-ry.  Pt.2.
    [Optics, molecular physics, and thermodynamics] Optika. Moleku-
    liarnaia fizika i termodinamika. Atomnaia fizika i fizika iadra.
    1960.  366 p.                                           (MIRA 13:10)
                    (Physics--Problems, exercises, etc.)

69734

21(7)
28(
21.2000

S/025/60/000/05/005/044
D048/D006

AUTHOR:        Rabinovich, M.S., Doctor of Physical and Mathematical
               Sciences, Lenin Prize Laureate

TITLE:         The Present and the Future of Acceleration Technology

PERIODICAL:    Nauka i zhizn', 1960, Nr 5, pp 17 - 23   (USSR)

ABSTRACT:      The author gives general data on modern acceleration
               technology and describes prospects for its future
               development. He refers to the synchrophasotron at
               the Ob"yedinennyy institut yadernykh issledovaniy
               (Joint Nuclear Research Institute) where protons
               are accelerated up to 10 billion evs. Proton mass
               increases by 10 at a velocity 0.5% under that of
               light. The perimeter of the proton's orbit in the
               synchrophasotron at Dubna is 200 m. In the 50-60
               billion ev accelerator projected in the Soviet
Card 1/3       Union it will be in the order of 1500 m. A method of

69734

S/025/60/000/05/005/044
D048/D006

The Present and the Future of Acceleration Technology

producing super-large magnetic fields and super-
strong focusing was suggested by Soviet physicist
G.I. Budker who recommended the use of a relatively
low energy of 5-15 million evs as the electron beam.
He gives the following example. Protons with an
electron current of 10.000 amps, an orbital radius
of 3 m and an electron energy of 15 mill evs can be
accelerated up to 100 billion evs. In 1953, Soviet
scientists A.A. Kolomenskiy, V.A. Petukh, and M.S.
Rabinovich suggested a ring phasotron. A.A. Kolo-
menskiy, recommended a symmetric ring phasotron con-
sisting of a number of absolutely equal magnetic
sections located in the surrounding regions. New
methods are shown by Academician V.I. Veksler, their
main feature consisting in the fact that the particles
themselves take part in the creation of an accelera-
tion field. Thus, an immense field of the necessary

Card 2/3

69734

S/025/60/000/05/005/044
D048/D006

The Present and the Future of Acceleration Technology

direction is produced in that region of space where
accelerated particles are present. As a concrete
circuit based on this method, the acceleration of
conglomerations of ions by electron current is men-
tioned. There are 10 drawings and 1 diagram on
page 2 of centerfold.

Card 3/3

81681

S/057/60/030/05/10/014
B012/B056

*24.2120*
*10.2000(A)*

AUTHORS:    Andryukhina, E. D., Grebenshchikov, S. Ye., Rabinovich, M.S.,
            Rayzer, M. D., Safronov, A. Ya., Shpigel', I. S.

TITLE:      Some Characteristic Features of Inductive Gas Discharges

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1960, Vol. 30, No. 5,
            pp. 529 - 538

TEXT:  The present paper was read at the 4th International Conference on
ionization processes held at Upsala in 1959. The authors carried out ex-
periments for the purpose of explaining the influence exerted by some
phenomena upon the dynamics of the plasma, which are described. The
experiments were carried out in axially symmetric homogeneous and non-
homogeneous magnetic fields within a wide frequency range under various
ratios between the inductive resistance and the effective resistance of
the plasma. The following of the phenomena mentioned were investigated:
the "capture" of the magnetic field by the moving plasma, the skin effect,
and the shock waves. Fig. 1 shows the oscillogram of the complete current
in a discharge in hydrogen, and Fig. 2 shows a slow-motion picture of the

Card 1/3

81681

Some Characteristic Features of Inductive Gas          S/057/60/030/05/10/014
Discharges                                             B012/B056

discharge. Measurements of current distribution showed that during the
first half-period of the field variation a re-distribution of the current
according to the vacuum chamber radius takes place. In Fig. 3a the device
for investigating the discharge in an axially symmetric field, the so-
called "magnetic mirror" is shown schematically. Fig. 3b shows the
dependence of the current generated by special windings upon radius R and
distance z. From the oscillograms in Fig. 4 it may be seen that the current
in the gas during the first half-period of the field change is due only to
the effective resistance of the plasma. The current polarity reversal
shown on the oscillograms and the instantaneous current distribution in
Fig. 6a indicating the existence of a considerable return current prove
the "capture" of part of the magnetic flux by the plasma. The investiga-
tions of the skin effect and of the shock waves described showed that in
the here investigated configurations of magnetic systems and vacuum
chambers a cylindrical shock wave is formed in the breakdown in the range
of $5 \cdot 10^{-1} \div 10^{-2}$ torr. During its motion it heats the gas and partly ionizes
it. With propagation of the wave the conductivity range increases, and
the currents generated within this range may, in the case of a skin
effect, compensate the entire exterior magnetic field in the larger part

Card 2/3

81681

Some Characteristic Features of Inductive Gas     S/057/60/030/05/10/014
Discharges                                          B012/B056

of the chamber. At high discharge frequencies $(300 \div 700 \text{ kc/s})$ a
sufficiently high conductivity of the plasma is necessary in order that a
skin layer having a thickness that is smaller than the height of the
chamber, may occur. Such a conductivity is attained after the passage of
2 to 3 shock waves through the vacuum. At frequencies of 60-100 kc/s the
thickness of the skin layer is greater than the height of the vacuum
chambers used in the present investigation and some other papers (Refs. 4
and 5), and no effects were observed in the distribution of the current
on the walls and also no screening of the outer field. Evaluations show
that in the here described experiments a qualitative relation

$\delta \sim \omega^{-1/2}$ is observed. No more accurate data could be found. $\delta$ is the
thickness of the skin layer, $\omega$ - the frequency of the external field.
Academician V. I. Veksler is thanked for discussing the paper with the
authors. There are 13 figures and 8 references: 5 Soviet and 3 English.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR Moskva
             (Institute of Physics imeni P. N. Lebedev of the AS USSR,
             Moscow)

SUBMITTED:   December 4, 1959
Card 3/3

S/056/60/038/004/020/048
B006/B056

AUTHORS:     Rabinovich, M. S., Iogansen, L. V.

TITLE:     Coherent Radiation of Electrons in a Synchrotron. III

TEXT:  In earlier papers (Refs. 1,2) the authors already investigated the
action of the coherent radiation forces upon the phase motion of elec-
trons in a synchrotron. However, the screening effect of the vacuum
chamber walls was not taken into account, and the particle cluster was
assumed to move in an unbounded free space. The same questions were dealt
with in the present article, but screening by the chamber walls was taken
into account. For reasons of simplicity it is assumed that the cluster
moves near an unbounded perfectly conducting plane or between two such
planes. The image method was found to be well suited for dealing with
such a problem. First, tangential ansatzes for the forces acting
tangentially and perpendicularly upon an electron are given and discussed.
Next, the interaction forces in the electron cluster are investigated, and

Card 1/3

83727

Coherent Radiation of Electrons in a
Synchrotron. III

S/056/60/038/004/020/048
B006/B056

approximation equations for the acting forces are obtained. Fig. 1 shows
the dependence of the coherent forces $f_{\tau\ coh}(\psi, p)$ given by (7) on the
azimuth $\psi$ for a cluster of Gaussian shape. In the maximum this force is
of the order of $Ne^2 p^2/a^2 \theta_o^{8/3}$. The powers of the forces $f_{\tau\ coh}(\ )$, given
by (5) and those given by (7) are of the order of $N^2 e^2 c/a^2 \theta_o^{4/3}$ and
$N^2 e^2 cp^2/a^2 \theta_o^{8/3}$, respectively. Fig. 2 shows the dependence of the
coherent forces $f_\tau$ (in $Ne^2/a^2$ units), which act upon a single electron of
a square cluster on $\psi$ for the special case $\theta_o = \pi/8$, p - 0.1. Herefrom it
may be seen that the regions near the cluster ends play the main part.
Finally, approximation formulas are given and discussed for the forces
acting in the interior of the cluster. The effect produced by the forces
(5) and (7) upon the phase motion of the electrons is estimated. The
minimum angular dimensions of the cluster due to the forces given by
(5) - without the shielding effect of the walls being taken into account -
are of the order of $\theta_o \sim (2\pi Ne/aV)^{3/7}$, and the analogous quantity taking

Card 2/3

83727

Coherent Radiation of Electrons in a
Synchrotron. III

S/056/60/038/004/020/048
B006/B056

shielding into account due to the forces given by (7) is
$\vartheta_o \sim (2\pi Nep^2/aV)^{3/11}$. (V is the effective amplitude of the high-frequency
voltage, $p = b/a \ll 1$, b - distance between the cluster and the screening
plane, a - radius of the particle orbit, $\vartheta_o^s$ - effective angular
dimension of the cluster, N - number of electrons). There are 2 figures
and 4 references: 2 Soviet and 2 US.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR
(Institute of Physics imeni P. N. Lebedev of the Academy of
Sciences, USSR)

SUBMITTED: September 30, 1959

Card 3/3

KOVRIZHNYKH, L.M.[translator]; RAYZER, M.D.[translator]; SHPIGEL',
I.S.[translator]; RABINOVICH, M.S., red.; BURTSEV, A.K.,
red.; POTAPENKOVA, Ye.S., tekhn. red.

[Plasma physics and magnetohydrodynamics] Fisika plazmy i mag-
nitnaia gidrodinamika; sbornik statei. Moskva, Izd-vo inostr.
lit-ry, 1961. 302 p. Translated articles.     (MIRA 15:3)
(Plasma (Ionized gases))  (Magnetohydrodynamics)

S/057/63/033/002/005/023
B108/B186

AUTHORS:        Levin, M. L., and Rabinovich, M. S.

TITLE:          A method of strong focusing for stabilization of straight
                and toroidal discharges

PERIODICAL:     Zhurnal tekhnicheskoy fiziki, v. 33, no. 2, 1963, 164-172

TEXT:  The stability of a thin curved plasma pinch is considered by
magnetohydrodynamical means applicable when only long-wave perturbations
are considered.  The Rouse function, which for the mechanical variables
plays the role of the general Lagrangian, is calculated under these
restrictions.  This function makes it possible to study the long-wave
motions of a plasma ring in an external magnetic field.  Here, only the
"snake" type motions are investigated (S. M. Osovets. ZhETF, 39, 311, 1960).
There are 2 figures and 1 table.

SUBMITTED:      February 20, 1962


Card 1/1

L 4241-66   EWT(1)/ETC/EPF(n)-2/EWG(m)/EPA(w)-2   LJP(c)   GS/AT

ACCESSION NR: AT5007972                                    S/0000/64/000/000/1017/1022

AUTHOR: Veksler, V. I.; Gekker, I. R.; Gol'ts, E. Ya.; Delone, G. A.; Kononov, B.; P.; Kudrevatova, O. V.; Lyk'yanchikov, G. S.; Rabinovich, M. S.; Savchenko, M. S.; Sarksyan, K. A.; Sergeychev, K. V.; Silin, V. A.; Tsopp, L. E.; Levin, M. L.; Muratov, R. Z.

TITLE: Radiational acceleration of plasma

SOURCE: International Conference on High Energy Accelerators. Dubna, 1963. Trudy. Moscow, Atomizdat, 1964, 1017-1022

TOPIC TAGS: high energy accelerator, plasma acceleration, plasma waveguide

ABSTRACT: The practical realization of the radiational method of plasma acceleration (Veksler, V. I. CERN Symposium, 1956; Atomnaya energiya 2, 427, 1957) is connected with the utilization of a different kind of waveguide structure, within which a plasma bunch moves under acceleration by an electromagnetic field. Two such waveguide structures, differing in type of accelerating wave and in method of plasma injection, were produced recently in the Physics Institute, AN SSSR. Initial experiments showed that radiational acceleration of plasma was achieved in both of the structures. At the same time the Radiotechnical Institute, AN SSSR,

Card 1/2

L 4241-66
ACCESSION NR: AT5007972                                                    6

carried out a theoretical study of the possibilities of the radiational method.
The present report contains a brief exposition of all these investigations, under
the two headings of:  experimental results and theory of radiational acceleration.
 Both waveguide structures employed one and the same super high-frequency oscilla-
tor of 10 cm range which operated in the single- stage pulse regime of 8 micro-
seconds duration; the average density of power flux through tube cross-section did
not exceed $8 \cdot 10^3$ watts/$cm^2$, and the KSVN of the entire waveguide system (without
plasma) was not worse than 1.3.  The accelerating waveguides were tubes of circular
cross-section with walls of noncorroding steel 1 mm thick; the vacuum in the tubes
was of the order of $10^{-7}$ to $10^{-6}$ mm of mercury.  The forces of the radiational
pressure which act upon the plasma bunch are found by proceeding from the conser-
vation laws.  In the plane electromagnetic wave propagated in free space the den-
sity of pulse flux equals the average energy density.  Orig. art. has:  7 figures,
26 formulas.                                                        YY

ASSOCIATION:  Fizicheskiy institut imeni P. N. Lebedeva AN SSSR (Physics Institute,
AN SSSR); Radiotekhnicheskiy institut AN SSSR (Radio Engineering Institute, AN
SSSR)     YY,

SUBMITTED:  26May64                ENCL:  00              SUB CODE:  NP
NO REF SOV:  008                   OTHER:  003
BVK
Card 2/2

L 18842-65     EPA(w)-2/EWT(1)/EWT(m)/EWA(m)-2    Pt-10/Pab-10    AFETR/AEDC(a)/
SSD(c)/BSD/SSD/AFWL/ESD(gs)/ESD(t)/IJP(c)
ACCESSION NR: AP4049038                          S/0057/64/034/011/1986/1991

AUTHOR: Zakharov, V.S.; Rabinovich, M.S.

TITLE: Strong focusing in helical magnetic fields

SOURCE: Zhurnal tekhnicheskoy fiziki, v.34, no.11, 1964, 1986-1991

TOPIC TAGS: helical magnetic field, strong focusing accelerator, betatron, synchrotron, electron accelerator

ABSTRACT: The motion of a charged particle in a doubly helical toroidal magnetic field superimposed on a synchrotron field is discussed with the purpose of assessing the advantages of such fields for particle accelerators. Specifically, the magnetic fields discussed have the form

$$H_z = H_z^0 \left\{ 1 - \frac{nx}{R} + N\epsilon \left[ \frac{z}{R} \sin 2N\theta + \frac{x}{R} \cos 2N\theta \right] \right\},$$

$$H_r = -H_z^0 \left\{ \frac{nz}{R} - N\epsilon \left[ \frac{z}{R} \cos 2N\theta - \frac{x}{R} \sin 2N\theta \right] \right\},$$

where $r, \theta, z$ are cylindrical coordinates, $R$ is the radius of the orbit, $x = r - R$, $N$ is an integer, and $n$ and $\epsilon$ are constants. The equations of motion are formulated

1/2

L 18842-65
ACCESSION NR: AP4049038                                                        $O$

and the solution is obtained for the case that the index n of the synchrotron field
is 1/2. It is found that strong focusing can be effected by large but easily at-
tainable helical fields. The effect of a static "longitudinal" (actually azimuthal)
field is calculated. It is found that the longitudinal field can either increase or
decrease the focusing effect, but that any improvement is insufficient to justify
the expense involved in producing the field. Synchrotron oscillations are discussed
and their critical energy, frequency and phase volume are calculated. The phase os-
cillations are similar to those of ordinary strong focusing synchrotrons and should
present no special difficulties. Resonance phenomena, including second order non-
linear resonances, are briefly discussed, and it is concluded that operation of the
accelerator far from resonance can be easily assured. It is concluded that the use
of helical fields can considerably improve the focusing, simplify the design and
increase the intensity of small iron-free betatrons and electron synchrotrons.
Orig.art.has: 44 formulas.

ASSOCIATION: none

SUBMITTED: 20Jan64                                                      ENCL: 00

SUB CODE: NP, EM                  NR REF SOV: 004                       OTHER: 000

2/2

ACCESSION NR:  AP4019255                    S/0056/64/046/002/0814/0816

AUTHORS:  Askar'yan, G. A.; Delone, N. B.; Rabinovich, M. S.

TITLE:  Action of intense light on matter and particle beams in a magnetic trap

SOURCE:  Zhurnal eksper. i teor. fiz. v. 46, no. 2, 1964, 814-816

TOPIC TAGS:  plasma, magnetic trap, magnetic trap filling, ionization, ionization by light flash, trap filling by light, plasma confinement, ion dissociation, molecule dissociation, neutral atom ionization

ABSTRACT:  The paper evaluates the efficiency of filling magnetic traps with fast ions produced by (1) heating and ionization of solid matter by a powerful flash of focused light in a magnetic field and (2) the action of intense light on beams of fast particles entering the trap.                    A method proposed by N. G. Basov and O. N. Krokhin is shown

Card    1/3

ACCESSION NR:  AP4019255

(ZhETF, v. 46, 171, 1964) to heat the ions through electron colli-
sions in a focused beam of coherent light has low efficiency  and
that it is better to have the ions produced by the light directly,
and not through the intermediacy of the electrons.  The resultant
ion energy is estimated to be approximately 10 times thermal, and
in view of the small initial dimensions of the heated region the
plasma can be confined by means of a pulsed magnetic field.  The
second method is based on a recently established fact that a focused
beam of coherent light exerts   strong ionizing action on a rarefied,
gas (E. Damon and R. Tomlinson, Applied Optics, v. 2, 546, 1963;
F. V. Bunkin and A. M. Prokhorov, ZhETF, v. 46, 1090, 1964).  The
fact that the ionization probability increases exponentially with the
power of the light ($W \sim e^{BP}$, where $B = \sim 3 \times 10^{-2} \text{ kW}^{-1}$) favors ef-
fective ionization of even fast particles.  It is shown that the
strong electric field of the coherent light can be used also to dis-
sociate or ionize molecular ions in addition to ionizing neutral
atoms following their entry into the trap.  Further research is

Card  2/3

ACCESSION NR: AP4019255

therefore urged, aimed at theoretical and experimental studies of
ionization and dissociation of molecules and molecular ions in a
strong light field. Orig. art. has: 1 formula.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR (Phys·
ics Institute, AN SSSR)

SUBMITTED: 20Nov63          DATE ACQ: 27Mar64          ENCL: 00

SUB CODE: PH               NO REF SOV: 004             OTHER: 001

Card 3/3

L 51299-65    EWT(1)    IJP(c)
ACCESSION NR: AP5013664                          UR/0386/65/001/001/0009/0015

AUTHOR: Askar'yan, G. A.; Rabinovich, M. S.; Savchenko, M. M.; Smirnova, A. D.

TITLE: Light spark in a magnetic field

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu.
Prilozheniye, v. 1, no. 1, 1965, 9-15

TOPIC TAGS: laser, laser induced spark, laser air breakdown, laser induced plasma,
controlled fusion reaction

ABSTRACT: The first results of experiments with a laser-induced spark in an external
magnetic field are presented. The magnetic field made it possible to study the
development of spark plasma based on diamagnetic induction signals, and to study
the spark-field interaction as applied to plasma containment, acceleration, and in-
jection into mirror machines. A Q-switched laser was used in the experiments. The
external d-c magnetic field was 10 koe. The most striking result of the experiments
was the long duration of the diamagnetic plasma (of the order of several micro-
seconds), which was bracketed by initiation and damping signal pulses on a baseline
5 μ sec long. The mechanism of formation of the prolonged magnetic moment is not

Card 1/2

L 51299-65

ACCESSION NR: AP5013664

clear. However, the effect may be utilized in attempts to inject additional energy into the spark plasma by h-f external fields or by longer-pulse lasers with a higher energy input. Orig. art. has: 4 formulas and 1 figure.                    [SK]

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute of the Academy of Sciences, SSSR)

| SUBMITTED: 03Feb65 | ENCL: 00 | SUB CODE: EC, EM |
|---|---|---|
| NO REF SOV: 006 | OTHER: 003 | ATD PRESS: 4014 |

Card 2/2

ASKAR'YAN, G.A.; RABINOVICH, M.S.; SAVCHENKO. M.M.; SMIRNOVA. A.D.

Detection of a quick photoionization halo and a cloud of concentrated long-lived ionization from a shock wave produced by a spark in a laser beam. Pis'. v red. Zhur. eksper. i teoret. fiz. 1 no.6:18-23 Je '65.

(MIRA 18:10)

1. Fizicheskiy institut imeni Lebedeva AN SSSR.

L 64775-65   EEC(k)-2/EWA(h)/EWA)k)/EWT(1)/EWT(m)/FBD/EWP(i)/EWP(b)/T/EWA(m)-2/EWP(k)/

ACCESSION NR:   AP5021736 EWP(e)   SCTB/IJP(g)   WG/WH UR/0386/65/002/002/0095/0097

AUTHOR:  Bedilov, M. R.; Likhachev, V. M.; Mikhaylov, G. V.; Rabinovich, M. S.

TITLE:  Use of the pinch-effect for optical laser pumping

SOURCE:  Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 2, no. 2, 1965, 95-97, and insert attached to p. 97

TOPIC TAGS:  glass laser, neodymium laser, ruby laser, laser pumping, optical pumping, pinch pumping, pinch effect

ABSTRACT:  Experimental use of the pinch-effect in gas for the optical pumping of $Nd^{3+}$ glass and ruby lasers is reported at currents up to 300 k-a with a rise rate of $3 \times 10^{11}$ amp/sec and discharge periods of approximately 4 μsec. The energy source was a specially constructed low-induction 30-μf, 9-kv capacitor bank. The experimental pump light efficiency in the 2000—6000 Å region using krypton gas at a 20 k-a/cm² current density was ~12%, and for a 1.2-kj input energy the output energy was ~150 j, of which 50—70 j was in the 4000—6000 Å region, and 80—100 j in the 2000—4000 Å region. The pump light spectrum was continuous and similar to the emission spectrum of a black body at 35,000K. The neodymium glass rod with silver-coated ends (coefficient of reflection 0.92 and 1.0) was 53 mm long and 7.6 mm in diameter. The

Card  1/2

L 64775-65

ACCESSION NR: AP5021736

stimulated emission, which occurred at 1.06 μ after ~15 μsec pumping, was observed for 8 μsec by an FEU-22 photomultiplier equipped with suitable filters. To achieve laser action in the available ruby crystals for the given pinch power, a combined pumping system was used. By placing a ruby crystal in the common focus of a double-branch elliptical reflector, and a quartz discharge chamber (100 mm long and ~30 mm in diameter) and an IFN-800 xenon lamp at the two other foci, the stimulated emission was observed. Under these pumping conditions the pulsed emission frequency increased approximately tenfold, with a 2—2.5-fold increase in the peak pulse amplitude. Orig. art. L. 2 figures. [YK]

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute, Academy of Sciences, SSSR)

SUBMITTED: 02Jun65          ENCL: 00                    SUB CODE: EC

NO REF SOV: 001            OTHER: 001                   ATD PRESS: 1/679

Card   2/2

L 10958-66    EWT(1)/T/EWA(m)-2   IJP(c)

ACC NR: AP6002464                          SOURCE CODE:   0386/65/002/011/0503/0506

AUTHOR:  Askar'yan, G. A.; Rabinovich, M. S.; Smirnova, A. D.; Studenov, V. B.

ORG:  Physics Institute im. P. N. Lebedev, Academy of Sciences, SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE:  Polarization of the ionization halo during air breakdown in a constant electric field

SOURCE:  Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 2, no. 11, 1965, 503-506.

TOPIC TAGS:  laser, nonlinear optics, laser pulsation, gas ionization, electric field, laser beam

ABSTRACT:  The ionization halo formed during gas breakdown at the focus of a beam from a Q-spoiled laser was investigated by studying its polarization due to an applied electric field, $E_0 = 10$ v/cm — 1 kv/cm, at the focus.  In the first series of experiments, the quickly varying field perturbations generated during formation of the halo were registered by a thin probe with a dielectric sheath placed perpendicularly to the electric field at a distance of approximately 1 cm above the breakdown.  The duration of a signal from the probe (30—50 µsec) was close to that of the laser pulse.  Its amplitude $E_m$ increased linearly with the increasing electric field ($E_m/E_0 \simeq 0.5 \times 10^{-3}$ cm).  By comparing the signal from the probe with the characteristics of the halo, it was established that the region from which the field was forced out ($\alpha_{eff}$) was $\simeq 1$ cm.  In the other series of experiments the

Card  1/2

L 10958-66

ACC NR:   AP6002464

breakdown occurred between two flat electrodes with a potential difference $\Delta v$ placed relatively far away from each other. One of the electrodes was grounded through a 75-ohm resistor, and the current flowing toward the electrode was measured. It was confirmed that $\alpha_{eff} \simeq 1$ cm. In the experiments it was established that the photoeffect of the spark formed during the breakdown and the photoelectric effect associated with the surfaces of the electrodes could be neglected. The ionization of the gas was attributed to the multiphoton absorption in the ultraviolet region of the spectrum or to absorption of kv x-ray photons emitted by the hot plasma in the breakdown region. The authors also discovered a rapidly generated intrinsic dipole moment of the spark, the direction of which is opposite to the light beam. This dipole moment is probably associated with light pressure or thermoelectric effects. Orig. art. has: 2 figures.                                                        [CS]

SUB CODE:   20 /       SUBM DATE:   18Oct65/   ORIG REF:   001/   ATD PRESS:  4/70

Card 2/2

L 1413-66    EWT(1)/ETC/EPF(n)-2/EPA(w)-2/EWG(m) , IJP(c)   AT

ACCESSION NR: AP5021572                          UR/0286/65/000/013/0045/0046

                                                 621.039.643

AUTHOR: Askar'yan, G. A.; Delone, N. B.; Rabinovich, M. S.

TITLE: A method of filling magnetic traps with a hot plasma. Class 21,
No. 172411

SOURCE: Byulleten' izobreteniy i tovarnykh znakov, no. 13, 1965, 45-46

TOPIC TAGS: laser, plasma, magnetic trap

ABSTRACT: The ionization and heating of a portion of matter in the focus of the
laser takes place in the magnetic field of the trap formed by fast ions produced
in gas-dynamic scattering of the plasma. By increasing the effectiveness of the
interaction of ions accelerated by electron pressure, the effectiveness of the
laser for obtaining the synthesis of high-temperature plasma is increased.    [ZL]

ASSOCIATION: none

SUBMITTED: 26Sep63              ENCL: 00                 SUB CODE: EM, EC

NO REF SOV: 000                OTHER: 000                ATD PRESS: 4091
Card 1/1

L 23868-65    EWT(1)/EWG(k)/EPA(sp)-2/EPA(w)-2/EEC(t)/T/EEC(b)-2/EWA(m)-2
Pz-6/Po-4/Pab-10/P1-4    IJP(c)    DM/AT

AUTHOR: Veksler, V. I.; Gekker, I. R.; Gol'ts, E. Ya; Delone, G. A.; Kononov, B.P.;
Kudrevatova, O. V.; Luk'yanchikov, G. S.; Rabinovich, M.S. Savchenko, M.M.; Sarksyan,
K. A.; Sergeychev, K. F.; Silin, V. A.; Trubb, L. E.

TITLE:   Interaction of plasma bunches with an electromagnetic wave

TOPIC TAGS:  plasma clot,  plasma clot acceleration,   plasma clot
radiative acceleration, H sub 01 wave, H sub 11 wave

ABSTRACT:  Preliminary experimental results are given of an investi-
gation of the radiative acceleration of plasma in circular waveguides.
The investigation was conducted in a 10-cm range with $H_{01}$ and $H_{11}$
waves.  Different plasma injectors were used.  Plasma bunches with an
initial particle concentration of $10^{12}$ $cm^{-3}$ and higher were injected
with a 5 x $10^6$ cm/sec velocity from a spark source or were generated
directly on the axis of the waveguide by means of a plasma source at
a pressure drop of $10^{-7}$—$10^{-6}$ mm Hg of the operating vacuum in an
accelerator.  Electric detectors, superhigh-frequency methods, and an
electrostatic analyzer of particle energy were used for the investiga-

Card  1/2

L 23868-65

ACCESSION NR: AP5003998                                  O

tion.  External magnetic fields with various configurations were used
to confine the plasma.  Accelerated ions with energies exceeding
10 kev were obtained regardless of the type of wave in the waveguide
or the kind of plasma injector.  The energy of the accelerated ions
increased as the superhigh-frequency power increased.  The total num-
ber of accelerated particles was of the order of $10^{12}$.  Maximum energy
was 50 kev.  The application of nonhomogeneous fields for the stabili-
zation of the transverse dimensions of plasma bunches was shown to be
feasible.  There were practically no plasma losses on the waveguide
walls when quadrupole or sextupole magnetic fields were used.  Orig.
art. has:  7 figures.                                            [JA]

ASSOCIATION:  none

SUBMITTED:  22Apr64        ENCL:  00           SUB CODE:  ME,EM

NO REF SOV:  008           OTHER:  001         ATD PRESS: 3178


Card  2/2

L 52022-65   EPA(w)-2/EWT(m)/EWP(1)   Pt-7/Pab-10   IJP(c)

ACCESSION NR:  AP5012057

*37*
*36*

AUTHOR: Zakharov,V.S.; Rabinovich,M.S.

*B*

TITLE:  Strong-focusing properties of a system of opposing magnetic fields

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 35, no. 5, 1965, 910-913

TOPIC TAGS:  particle accelerator, strong focusing accelerator, synchrotron, *19*
betatron, longitudinal magnetic field

*19*

ABSTRACT:  The authors discuss the strong-focusing properties of a longitudinal magnetic field of alternating direction.  The magnetic fields discussed are those described by a scalar potential of the form

$$\Phi = \sum_{n=0}^{\infty} \frac{h_{2n+1}}{\alpha} I_0\left[(2n+1)\alpha\rho\right] \sin\left[(2n+1)\alpha R\theta\right],$$

where r, $\theta$, z are cylindrical coordinates, R is the radius of the equilibrium orbit, $\alpha = 2\pi/L$ where L/2 is the distance between successive windings in which the currents are in opposite directions, $\rho$ is the distance from the equilibrium orbit, $I_0$ is the Bessel function of an imaginary argument, and the h are constants.  Only the first

Card 1/2

L 52022-65

ACCESSION NR: AP5012057

term of this expansion is employed in the calculations. A suitable guiding field with components in the z and r directions is superimposed, and calculations are also performed for the currugated field obtained by superimposing a constant longitudinal (azimuthal) field. The frequencies of the betatron and synchrotron oscillations are calculated and the corresponding phase volumes are estimated. It is found that the alternating and corrugated fields exert considerably stronger focusing action than a simple longitudinal field. Because of the simplicity of design, this type of focusing should find application to moderate energy synchrotrons and betatrons, particularly to iron-free accelerators and plasma betatrons. Orig. art. has: 21 formulas.

ASSOCIATION: Moskovskiy gosudarstvennyy pedagogicheskiy institut im. V.I.Lenina (Moscow State Pedagogical Institute)

SUBMITTED: 26Jun64.

NR REF SOV: 004

ENCL: 00

OTHER: 000

SUB CODE: NP, EM

Card 2/2

EWA(m)-2     FJ-4/FI-4/FI-4/FU-4/FF-4/FAU-10     10F(6)     UHU/NU/WW

ACCESSION NR: AP5004403                           S/0056/65/048/001/0290/0294

AUTHOR: Askar'yan, G. A.; Rabinovich, M. S.

TITLE: Cascade ionization of a medium caused by an intense light flash

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 48, no. 1, 1965, 290-294

TOPIC TAGS: laser, gas ionization, laser induced ionization, laser induced gas breakdown, focused light ionization, plasma acceleration

ABSTRACT: A theory of laser-induced gas breakdown is considered for the case of electric field intensities of the light beam greater than $10^7$ v/cm. The theory is based on the cascade ionization concept, in which the field intensities involved have a high probability of ionizing atoms previously excited up to the second or third levels. Sufficient density of excited atoms is provided by interaction with electrons which have absorbed laser light quanta of the order of magnitude of 1 ev. Thus, the energy of the excited atoms is directly expended on the cascade development, giving it a high initial rise rate. For example, given an electric field intensity of $3 \cdot 10^7$ v/cm and an ionization potential of 10 ev, the cascade rise time will be $3 \cdot 10^{-8}$ sec. The authors also consider the effect of an external magnetic field on the laser-induced spark in order to investigate the possibility of manipu-
Card 1/2

L 25282-65

ACCESSION NR: AP5004403

lating the resulting plasma. The inductive signal from the magnetic interaction is derived as a function of conductivity, dimensions, and expansion rate of the laser-produced plasma. The small dimensions of the breakdown region allow for the application of high magnetic fields of the order of $10^5$—$10^6$ oe, yielding high directed velocities of the ionized material; these can in turn be utilized for various experiments, e.g., in controlled fusion reactions. Other effects of the cascade ionization process can lead to an enhanced absorption of high-intensity light and the generation of plasma trails in the path of intense light beams which can direct or reflect radio waves, disturb fields and waves, etc. Orig. art. has: 13 formulas. [SK]

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute, Academy of Sciences, SSSR)

SUBMITTED: 10Jul64                 ENCL: 00                    SUB CODE: EC, ME

NO REF SOV: 004                    OTHER: 002                  ATD PRESS: 3184

Card 2/2

3C

L 35592-65   EPA(w)-2/EWT(1)/EEC(t)/EPA(sp)-2/T/EWA(m)-2   P1-4/Po-4/Pz-6/Pab-10
              IJP(c)   AT
ACCESSION NR: AP5007656                               S/0020/65/160/006/1293/1295
                                                                          13

AUTHORS: Batanov, O. M.; Berezhetskiy, M. S.; Grebenshchikov, S. Ye.; Zverev,
N. M.; Popryadukhin, A. P.; Rabinovich, M. S.; Sbitnikova, I.S.; Shpigel', I.S.

TITLE: Magnetic surfaces and plasma containment in the helical field of a
stellerator with external injection

SOURCE: AN SSSR. Doklady, v. 160, no. 6, 1965, 1293-1295

TOPIC TAGS: stellerator, plasma trapping, plasma injection, magnetic field,
helical magnetic field, resonance excitation, controlled fusion

ABSTRACT: Magnetic surfaces and external injection techniques in a 10 000-oersted
longitudinal field stellerator (1200 mm large diameter and 100 mm small diameter)
are discussed briefly. The parameter $\mathcal{E}$, equal to the ratio fundamental harmonic
of field over longitudinal field, varies within the limits of 0.71-0.33, and the
helical winding is at $45°$. To verify the existence of magnetic surfaces, a
pulsed electron gun is used as well as a $3 \times 3$ mm$^2$ probe. The results show an
unperturbed magnetic surface at $\mathcal{E} = 0.40$, a resonance excitation of the second
kind at $\mathcal{E} = 0.37$ with an external undisturbed surface, and an internal undisturbed

Card 1/2

L 35592-65

ACCESSION NR: AP5007656                                          0

surface with a resonance of the third kind at $\mathcal{E}$ = 0.39. The external injection
was accomplished by means of four plasma spark injectors operating simultaneously
for 0.4 $\mu$ sec. Oscillograph studies indicate that the time for attaining a
steady state distribution in density across the chamber corresponds to $R/v_T$, where
R is the large chamber radius and $v_T$ is the ionic thermal velocity. Comparing
density distributions in the helical field to those of a toroidal field, the
distinct influence of the former on the density distribution becomes obvious.
Orig. art. has: 2 figures.

ASSOCIATION: none

SUBMITTED: 09Jul64          ENCL: 00                    SUB CODE: GP

NO REF SOV: 004             OTHER: 002

Card 2/2

L 26072-66    EWP(j)/EWT(l)/EWT(m)/ETC(m)-6/T    RM/DS/WW/JW

ACC NR: AP6015804                                SOURCE CODE: UR/0386/66/003/010/0404/0407

AUTHOR: Askar'yan, G. A.; Gol'ts, E. Ya.; Rabinovich, M. S.; Studenov, V. B.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE: Electric breakdown through a flame

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 3, no. 10, 1966, 404-407

TOPIC TAGS: electric discharge, dielectric breakdown, flame, discharge plasma, exploding wire

ABSTRACT: To investigate electric breakdown through a flame with an aim at obtaining data of value to gas-discharge physics, shock-wave production under laboratory conditions, and for production of intense flashes, cumulative collapses, pinches, etc. at atmospheric pressures without surrounding the discharge with chamber walls, the authors discharged a bank of five capacitors of 150 µF each, charged to 5--10 kv, through a vacuum discharge gap into a flame plasma. The discharge development was recorded by a high-speed camera (SFR). The flash of light was recorded with a photo-multiplier and its energy measured with a special calorimeter. The current flowing through the plasma was measured with a Rogowski loop and reached several hundred ka. A vertical flame jet was produced by a burner using a mixture of illuminating gas and oxygen. The temperature of such a flame usually does not exceed 2000°. One electrode was the body of the burner, and the other was a high-melting-point metal rod. The

Card 1/2

L 26072-66

ACC NR: AP6015804    5

experiment has shown that the initial breakdown voltage in the plasma is close to 1 kv/cm, which is several dozen times smaller than the breakdown voltage under normal conditions. A flame jet 10 cm long broke down regularly at 10 kv, and the flame was not extinguished after the breakdown. The duration of the intense glow was ~150 μsec. Comparison of the signals from the photomultiplier used to record the glow from the discharge plasma with the current through the discharge shows that the buildup and glow times are commensurate with the growth and duration of the discharge currents. From this and from comparison of the optical radiation with the flash energy produced by discharging the same capacitor bank through an exploding wire it is concluded that the essential stage for the radiation in the given section of the spectrum is not the initial one, but the subsequent development of the discharge, in view of the long duration of the process of discharging the capacitor bank. The use of a flame from one or several burners, besides facilitating the breakdown of long gaps, makes it possible to increase further the linear dimensions of the breakdown path without resorting to the inconvenient frequent replacement of contacts (foils and wires) required in other methods. Discharge through a flame is also of practical interest for intensification of chemical reactions in flames, for physics of atmospheric phenomena, and other effects. The authors thank V. P. Solov'yev, B. P. Shurukhin, and A. V. Chirkov for help in creating the installation. Orig. art. has: 2 figures.    [02]

SUB CODE: 20/    SUBM DATE: 22Mar66/    OTH REF: 002/    ATD PRESS: 4252

Card 2/2    CC

L 30389-66    EEC(k)-2/EWP(k)/EWT(1)/FBD/I    IJP(c)    WG

ACC NR: AP6020790                           SOURCE CODE: UR/0386/66/003/012/0465/0468

96

AUTHOR: Askar'yan, G. A.; Rabinovich, M. S.; Savchenko, M. M.; Stepanov, V. K. 93

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences, SSSR (Fizicheskiy B
Institut Akademii nauk SSSR)

TITLE: Fast overlap of microwave radiation by an ionization aureole of a spark in
a laser beam

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu.
Prilozheniye v. 3, no. 12, 1966, 465-468

TOPIC TAGS: gas ionization, ionization phenomenon, ionized plasma, microwave
plasma, SPARK SHOCK WAVE, LASER BEAM

ABSTRACT: This is a continuation of earlier investigations (Pis'ma ZhETF v. 1,
no. 6, 18, 1965) of the ionization aureole behind the shock wave of a light spark
in a laser beam. The present study deals with shorter times (tens and hundreds
of nanoseconds), when the ionization leads the shock wave from the spark. The
spark from a Q-switched laser beam was flashed in front of a radiating antenna
fed from an 8-mm magnetron. The receiving antenna was placed either behind the
spark (in aureole overlap investigations) or at different angles (in reflection
investigations). The area of the microwave radiation overlap by the aureole was

Card 1/2

L 30389-66
ACC NR: AP6020790

determined by comparing the overlap signal at different distances from the spark
to the antenna axis and found to have a radius of 1.5 - 2 cm. The values of the
reflection signals at different large angles, including back reflection, were com-
mensurate with the overlap signal. This shows that the scattered radiation is due
not only to the absorption diffraction, but also to the high reflectivity of the
aureole plasma. The electron density in the latter is estimated to be $\sim 10^{13}$ $cm^{-3}$,
which is two orders of magnitude higher than the intensity obtained by the authors
from polarization measurements (Pis'ma ZhETF v. 2, 503, 1965). The sparks and
ionization aureoles differed for different gases (air, oxygen, argon, nitrogen,
helium, hydrogen). The high speed of the strong overlap of radiation by the fast
aureole after a time $\sim 10$ nsec, and the large overlap area, suggest that the fast
aureole may be useful for sharp overlap, modulation, or diversion of microwave
beams. The authors thank D. K. Akulina and A. D. Smirnova for valuable advice,
and L. Kolomeytsev for help with the work. Orig. art. has: 2 figures.     [02]

SUB CODE: 20/     SUBM DATE: 04Apr66/     ORIG REF: 002 /  ATD PRESS: 5017

Card 2/2  d C

1. 45778-66    EEC(k)-2/EWP(k)/EWT(1)/EWT(m)/T/EWP(e)    IJP(c)    WH/WG

ACC NR:    AP6031986                    SOURCE CODE:  UR/0386/66/004/005/0177/0180

AUTHOR:  Askar'yan, G. A.; Rabinovich, M. S.; Smirnova, A. D.; Stepanov, V. K.; Studenov, V. B.

ORG:  Physics Institute im. P. N. Lebedev, Academy of Sciences, SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE:  Excitation of signals in a negatively charged post of an antenna under the influence of an unfocused laser beam

SOURCE:  Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 4, no. 5, 1966, 177-180

TOPIC TAGS:  laser application, shf antenna, electron emission

ABSTRACT:  The authors describe the results of an investigation of current pulses produced when an unfocused laser beam strikes a metallic electrode or a post that serves as an antenna, on which a negative potential is applied.  An ordinary Q-switched ruby laser was used, whose beam was aimed onto an antenna post located several meters away and under a negative voltage U $\approx$ 0 - 3 kev.  The antenna post was connected to ground through a capacitor and a resistor.  The pulse picked off the resistor was fed through a capacitor and amplifiers (UR-3 and UR-4) to an oscilloscope (S1-10).  The pulse induced in the antenna was commensurate in length with the duration of the laser flash. The pulse amplitude was at first approximately proportional to the voltage applied to the antenna but at a voltage $\gtrsim$ 1 kv the magnitude of the signal increased sharply with

Card  1/2

L 45778-66

ACC NR: AP6031986

increasing voltage. No noticeable signals were registered at zero and positive poten-
tials. The mechanism of the observed pulses is shown to be connected with the current
produced when the electrons knocked out by the laser radiation are removed from the
post. The production of free electrons may be connected with the photoeffect from the
oxidized surface (if the surface is clean, the laser quantum energy is insufficient to
produce the photoeffect), with the heating of the electrons on the surface of the metal
upon absorption of the laser light, with a burst of photoelectric field emission, or
with a cascade. If the role of the light were to consist of facilitating the cold
emission under the influence of the field, or if cascade multiplication of the elec-
trons in the gas at the post were to take place, then the dependence of the current on
the voltage should be much stronger. It is possible that some of the foregoing pro-
cesses are responsible for the intensification of this dependence at sufficiently large
field intensities. When the gas pressure around the antenna decreases, the electron
mobility increases and the voltage needed to remove the electrons can be small. The
described effect can be used for remote excitation of receiving and transmitting anten-
nas with the aid of a guided laser beam, to register and measure laser radiation power,
etc. Orig. art. has: 2 figures and 1 formula.                                    [02]

SUB CODE: 20, 09/     SUBM DATE: 16Jun66/     ATD PRESS:     5084

Card 2/2

ACC NR: AT6033038                 SOURCE CODE: UR/2504/66/032/000/0089/0096

AUTHOR: Askar'yan, G. A.; Rabinovich, M. S.

ORG: Physics Institute im. P. N. Lebedev (Fizicheskiy institut)

TITLE: Ionization of a medium and production of plasma by a laser beam

SOURCE: AN SSSR. Fizicheskiy institut. Trudy, v. 32, 1966. Fizika plazmy (Plasma physics), 89-96

TOPIC TAGS: laser, laser beam, laser beam effect, ionization, medium ionization, plasma production, plasma trapping, plasma physics

ABSTRACT: A review is presented of investigations of the use of laser beams for the solution of numerous problems in plasma physics. The review is considered "preliminary," since it deals with a new field. The first section discusses avalanche ionization of a medium by an intense light flash and is concerned with field strengths of $10^7$ v/cm or over. The second section discusses the diamagnetic perturbation due to ionization of the medium in a beam of intense light, specifically the possible effects on such plasma by external inhomogeneous magnetic fields. The hot plasma's diamagnetism makes it possible for an inhomogeneous magnetic field to act upon it by accelerating the ionized clouds or throwing it into a trap. A very high field strength $10^5$ to $10^6$ oe) applied to small plasma clouds can produce extremely high ejection speeds which can be employed for various plasma and pre-

Card  1/2

ACC NR: AT6033038                                                 ○

thermonuclear processes. The third and fourth sections concern magnetic traps. The advantages of action of intense light upon dense matter placed directly in a magnetic trap are discussed. The steep characteristic of the dependence of ionization rate of rarefied gas on the intensity of light makes it possible, by increased intensity of the light beam (of about 500 Mw), to ionize fast particles (e.g., $10^8$ cm/sec) with a probability close to unity. The most advantageous method would be action upon molecular ion beams directed into the trap. The analysis of the processes involved also shows the advantages of using higher harmonics, polarized atoms, and light beams modulated by half the natural frequency of the atoms in the molecule, and by various resonance manipulations of the pumping field.

SUB CODE: 20/ SUBM DATE: none/ ORIG REF: 007/ OTH REF: 006/ ATD PRESS: 5099

Card 2/2 ŁC

ACC NR: AT6033039                          SOURCE CODE:  UR/2504/66/032/000/0097/0106

AUTHOR: Bedilov, M. R.; Likhachev, V. M.; Mikhaylov, G. V.; Rabinovich, M. S.

ORG: none

TITLE: Investigation of the radiation of a straight self-compressed discharge (pinch) in the visible and ultraviolet regions. 1. Fast discharge at small current densities

SOURCE: AN SSSR. Fizicheskiy institut. Trudy, v. 32, 1966. · Fizika plazmy (Plasma physics), 97-106

TOPIC TAGS: plasma pinch, plasma radiation, UV spectrum, plasma discharge

ABSTRACT: The experimental apparatus is shown in Fig. 1. The distance between electrodes was 16 cm and the diameter of the electrodes was 20 cm. The source of energy was a battery of condensers with a capacitance of 20 microfarads. Commutation of the current was accomplished with a vacuum discharger with igniting electrodes. The parasitic inductance of the loop was approximately 6 cm. To the electrodes of the chamber there was applied a current of 9 kilowatts, which corresponded to an energy supply of about 1 kilojoule. The apparatus made it possible to generate current pulses up to 300 kiloamps at a discharge time of 4 microseconds. Discharge investigations were carried out for He, Ne, Ar, Kr, Xe, $H_2$, and air. The discharge
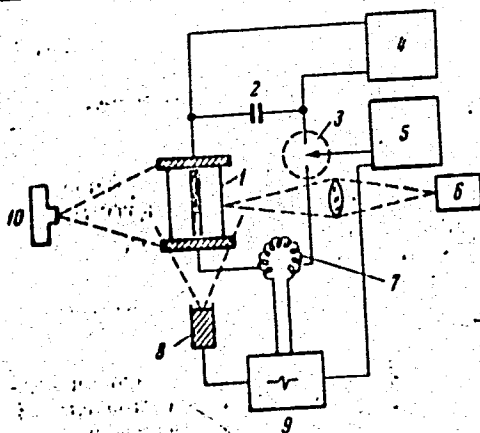
Card 1/3

ACC NR: AT6033039



Fig. 1.  Scheme of experimental unit.
1—discharge chamber; 2—battery of condensers; 3—vacuum discharger;
4—feeding unit; 5—control unit; 6—ISP-30 spectrograph; 7—Rogowski
loop; 8—FEU-14B photomultiplier; 9—OK-17M oscillograph; 10—photochamber.

for each gas was studied at pressures from $10^{-1}$ to 10 torr.  On the basis of the
experimental data calculations were made of the distribution of the radiation over the
chamber, the time characteristics of the discharge, the spectral composition of the

Card  2/3

ACC NR: AT6033039

radiation yield.  A large table shows the energy characteristics of the radiation of a pinched plasma for the six gases studied.  "In conclusion the authors express their thanks to their laboratory co-workers A. N. Pantyushin and L. N. Spiridonova for help in carrying out the experiments."  Orig. art. has:  6 figures and 1 table.

SUB CODE:  20/  SUBM DATE:  none/  ORIG REF:  002/  OTH REF:  006

Card  3/3

ACC NR: AT6033040

SOURCE CODE: UR/2504/66/032/000/0107/0111

AUTHOR: Likhachev, V. M.; Mikhaylov, G. V.; Rabinovich, M. S.

ORG: none

TITLE: Investigation of the radiation of a straight self-compressed discharge (pinch) in the visible and ultraviolet regions. 2. Fast discharge at large current densities

SOURCE: AN SSSR. Fizicheskiy institut. Trudy, v. 32, 1966. Fizika plazmy (Plasma physics), 107-111

TOPIC TAGS: plasma pinch, plasma radiation, UV spectrum, plasma discharge

ABSTRACT: The basic experiments on the dependence of the radiation of the discharge on the voltage supplied (energy) were carried out in a chamber with a diameter of 50 mm and a length of 100 mm (the walls of the chamber were made of quartz and the electrodes of copper). The chamber was filled successively with hydrogen, helium, and krypton at a pressure of 1 torr. For each gas, photos were taken of the spectrum at battery energies of: 135 joules (3 kilowatts), 540 joules (6 kilowatts), and 1200 joules (9 kilowatts). The results are shown in a series of figures. In general the results point to the possibility of using a self-compressed discharge as a pulse source of radiation of small duration with a continuous emission spectrum. In the ultraviolet region, this source yields stronger radiation than a xenon lamp. "In conclusion, the

Card 1/2

ACC NR: AT6033040

authors thank their coworkers in the laboratory, A. N. Pantyushin and A. V. Spiridonova for their help in preparing and carrying out the experiment." Orig. art. has: 4 figures.

SUB CODE: 20/ SUBM DATE: none/ ORIG REF: 001/ OTH REF: 001

Card 2/2

L  07825-67   EWT(1)/EWT(m)/EFC(k)-2/EWP(c)/EWP(t)/ETI/EWP(k)   IJP(c)   DS/WG/JD

ACC NR: AP6034216                          SOURCE CODE:  UR/0368/66/005/004/0534/0535

AUTHOR:  Kulagin, S. G.; Likhachev, V. M.; Rabinovich, M. S.; Sutovskiy, V. M.

ORG:  none

TITLE:  Pulsed argon laser at high-density currents and low pressures

SOURCE:  Zhurnal prikladnoy spektroskopii, v. 5, no. 4, 1966, 534-535

TOPIC TAGS:  gas laser, argon laser, high intensity laser, pulsed laser

ABSTRACT:  Oscillation of a pulsed $Ar^+$ laser at heavy currents (up to ~15—20 kamp/$cm^2$) and low pressures ($10^{-1}$—$6 \times 10^{-3}$ mm Hg) was investigated experimentally. The heavy current pulsed discharge was achieved in quartz tubes 1000 mm long and 10 mm in (internal) diameter. The tubular electrodes, made of tantalum, were 50 mm long and 10 mm in diameter. The output of the gas-discharge chamber was directed through quartz plane-parallel plates situated 150 mm from the electrodes at Brewster angles. The cavity consisted of two spherical mirrors with a 300-mm radius of curvature, placed 1500 mm from each other. One mirror was silver coated and the other dielectric coated (reflectivities were 90 and 30%, respectively). The energy was supplied from condensers with capacities of 0.01, 0.1, 0.4, and 2.6 µF at 10—25 kv. The equipment was capable of generating 1—15 kamp pulses for 1—5-µsec discharge periods. The output radiation was recorded photoelectrically. The experiments were carried out in spectrally pure argon in the pressure range from $10^{-1}$ to $6 \times 10^{-3}$ mm Hg. The

Card  1/2                            UDC:  621.375.9

L  07825-67

ACC NR:   AP6034216                                                                    $O$

oscillation maximum corresponds to a very narrow range of pressures from $2 \times 10^{-2}$ to $8 \times 10^{-3}$ mm Hg and the output intensity increases with the discharge current (20—25 kw at ~15 kamp).  The duration of oscillation decreases with decreasing pressure and an increasing rate of current buildup.  The laser spot structure was highly inhomogeneous with the brightness maximum at the periphery.  A more uniform distribution of the spot brightness was achieved with increased discharge currents. Under experimental conditions, discharge collapse (pinch effect) in the direction of the axis presumably enhanced oscillation conditions.  However, due to the small diameter of the discharge tube, this effect could not be recorded.  Orig. art. has: 2 figures.

SUB CODE:  20/  SUBM DATE:  16Sep65/  ORIG REF:  005/  ATD PRESS:  5101

Card   2/2   bc

ACC·NR: AP7001340                          SOURCE CODE: UR/0386/66/004/011/0453/0456

AUTHOR: Askar'yan G. A.; Gol'ts, E. Ya.; Rabinovich, M. S.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences SSSR (F'zicheskiy institut Akademii nauk SSSR)

TITLE: Use of artificial meteors for laser pumping

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 4, no. 11, 1966, 453-456

TOPIC TAGS: laser pump, mhd shock wave, mhd generator, ammunition projectile

ABSTRACT: In connection with recently published reports of the use of the energy of an explosion or a flame jet for laser pumping, the authors discuss certain possibilities of using artificial meteors (rapidly moving bodies accelerated by gunshot) to pump medium-power lasers. It is estimated that the energy of a shot from a modern weapon ranges from several kJ (ordinary rifle) to several hundred kJ (cannon) and that at a repetition frequency of 10 - 30 shots per second and an efficiency ~1% this would yield 10 J - 1 kJ. The mechanism of converting the bullet energy into pump energy may be provided either by the flash of light produced by the compression wave in front of the bullet, or by magnetohydrodynamic generation of electric energy by the bullet. In the former case, a bullet maintained at ~3 km/sec over a path length of ~1 m can produce a sufficiently intense pump flash, especially if it moves through a jet of gas having high emissivity. In the mhd case, the electric energy is produced by induc-

Card  1/2

ACC NR: AP7001340

tion as the bullet moves transversely to a strong magnetic field. The necessary conducting circuit is provided by the gas ionized by the moving body. A pulse power of several dozen megawatts can be produced at a velocity of -3 km/sec and a path length ~30 cm. It is concluded that the described method can be used to construct compact pump systems for laboratory lasers without resorting to capacitor banks.

SUB CODE: 20/  SUBM DATE: 22Aug66/  ORIG REF: 002/  OTH REF: 002
ATD PRESS: 5108

Card 2/2

L 10402-67   EWT(1)   IJP(c)   AT        SOURCE CODE: UR/2504/66/032/000/0060/0079

ACC NR: AT6033036

AUTHOR: Veksler, V. I.; Gekker, I. R.; Gol'ts, E. Ya.; Kononov, B. I.; Luk'yanchikov, G. S.; Rabinovich, M. S.; Sarksyan, K. A.; Sergeychev, L. I.; Silin, V. A.; Gerp, L. E.

ORG: none

TITLE: Radiation acceleration of a plasma

SOURCE: AN SSSR. Fizicheskiy institut. Trudy, v. 32, 1966. Fizika plazmy (Plasma physics), 60-79

TOPIC TAGS: plasma acceleration, HF oscillator

ABSTRACT: The article is of the review type (41 literature references) and surveys work done in the field in the Soviet Union, Japan, the United States and France. After a general mathematical introduction to the subject, the authors describe the first experiments on the radiation acceleration of plasmas using superhigh frequency generators. Detailed diagrams are given of two such systems. Detailed consideration is given to the investigation of the special characteristics of the interaction of superhigh frequency oscillations in a plasma, including the effect of plasma resonance, and the acceleration of a plasma by the action of the gradient of a superhigh frequency field. The two final sections deal respectively with the acceleration of a plasma in

Card 1/2

L 10402-67

ACC NR: AT6033036

a longitudinal magnetic field, and the injection of pure hydrogen plasma clusters of small size. Orig. art. has: 15 formulas and 17 figures.

SUB CODE: 20/ SUBM DATE: none/ ORIG REF: 026/ OTH REF: 015

Card 2/2

ACC NR: AP7004942                    SOURCE CODE:   UR/0386/67/005/002/0055/0057

AUTHOR: Likhachev, V. M.; Rabinovich, M. S.; Sutovskiy, V. M.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences, SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE: Feasibility of investigating a pinch discharge by using its intrinsic stimulated emission

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 5, no. 2, 1967, 55-57

TOPIC TAGS: stimulated emission, plasma diagnostics, discharge plasma, plasma pinch, laser effect, light temperature plasma, plasma discharge

ABSTRACT: This is a continuation of earlier work (Pis'ma ZhETF v. 3, 12, 1966), where the existence of negative-temperature states in a high-temperature plasma of a strong-current pinch discharge was demonstrated. In this article the authors report the use of this phenomenon to investigate the cumulation of a pinch discharge. This was done by measuring (with a Rogowski loop) the time correlation between the stimulated-emission pulse and the current pulse at the instant of discharge cumulation. The discharge current reached 20 kiloamp at 2 μsec duration, and the current density at the instant of cumulation reached 50 - 75 ka/cm$^2$. The stimulated-emission pulse was observed by mounting confocal dielectric-coated mirrors at the ends of the discharge tube. The working gas was pure argon. The measurements show that the

Card 1/2                              UDC:   none

ACC NR: AP7004942

maximum of the generation pulse coincides with the instant of current cumulation. Furthermore, generation occurs not only during the instant of maximum pinch contraction, but also as the plasma front moves during the stage immediately preceding the discharge cumulation. However, the emission maximum coincides with the current maximum. Generation takes place only at sufficiently large currents (large discharge capacitor, 0.4 µF, charged to high voltages up to 45 kv). The characteristics of the stimulated emission depend strongly on the discharge conditions, so that an investigation of the laser action can serve as an additional means of plasma diagnostics. It is further hoped that at sufficiently high generation power the emission can also be used to determine the plasma parameters directly at the instant of generation by incoherent ion or electron scattering, by linear plasma interaction, and by similar effects. Orig. art. has: 2 figures.

[02]

SUB CODE: 20/    SUBM DATE: 25Oct66/    ORIG REF: 001/    ATD PRESS: 5114

Card 2/2

1. RABINOVICH, M.V.   SOTOVA, A. M.

2. USSR (600)

3. Herpes Zoster

4. Herpes zoster of the oral mucosa and of facial skin.
   Stomatologiia.  No. 4 - 1952

9. Monthly List of Russian Acessions, Library of Congress, February, 1953.  Unclassified.

KHAGHTUR'YAN, G. KH., DCCENT, RABINOVICH, M. V.

Aneurism, Aortic

Syphilitic aortic aneurism with damage of the sternum.  Vest. wn. i derm.no.
5, Sept.-Oct., 1952.

9.  Monthly List of Russian Accessions, Library of Congress, ___December 1953/2Unclassified.

RABINOVICH, M.V.

Iodine contact dermatitis in surgery and its prophylaxis. Sov. med.
21 no.7:44-49 Jl '57.                              (MIRA 12:3)

1. Iz kafedry fakul'tetskoy khirurgii (zav. - prof. A.N. Bakulev) II
Moskovskogo meditsinskogo instituta imeni I.V. Stalina i kafedry kozh-
nykh bolezney (zav. - doktor med. nauk G. Kh. Khachatur'yan) Kalininskogo
meditsinskogo instituta.
          (DERMATITIS, CONTACT, etiol. & pathogen.
               iodine tincture in surg. patients (Rus))
     (IODINE, inj. eff.
          contact dermatitis in surg. patients (Rus))

RABINOVICH, M. V.:  Master Med Sci (diss) -- "Iodine contact dermatitis in sur-

ry and its prophylaxis".  Moscow, 1959.  14 pp (Second Moscow State Med Inst im

N. I. Pirogov), 250 copies (KL, No 15, 1959, 120)

RABINOVICH, M.V., inzh.

Semitrailer asphalt spreader drawn by the MAZ-205 truck.
Avt.dor. 22  no.11:19  N  '59.                    (MIRA 13:2)
        (Truck trailers)  (Asphalt)

RABINOVICH, M.V.; ZINGER, Z.E.

In the Scientific and Technical Society. Avt.dor. 24 no.4:31 Ap
'61.                                    (MIRA 14:5)
(Highway research)

RABINOVICH, M.V.; GANYUSHIN, A.I.

Precisely, clearly, businesslike. Avt. dor. no.10:31 O '64.
(MIRA 17:2)

1. Predsedatel' dorozhnoy sektsii Nauchno-tekhnicheskogo
obshchestva gorodskogo khozyaystva i avtomobil'nogo transporta
Estonskoy SSR (for Rabinovich).

EXCERPTA MEDICA Sec 2 Vol 12/5  Physiology  May  59

1895. ELECTRICAL ACTIVITY OF DIFFERENT CORTICAL LAYERS OF THE
MOTOR AND ACOUSTIC ANALYSORS WHEN ELABORATING DEFENSIVE
CONDITIONED REFLEXES (Russian text) - R a b i n o v i c h  M. Y.  Electro-
physiol. Lab., Inst. of Brain, USSR Acad. of Med. Scis, Moscow - ZH.
VYSSH. NERV. DEYAT. 1958, 8/4 (546-559) Graphs 5

Experiments were performed on dogs with electrodes chronically implanted at the
level of different cortical layers of the motor and acoustic analysors. The depth of
insertion of the electrodes to the level of each layer corresponded to the measured
distance of the particular layer from the surface of the cortex. Conditioned reflex-
es were elaborated to tones from a sound generator rhythmically interrupted with
different frequencies, or to a buzzer. The defensive conditioned reflex was rein-
forced by the administration of an electric shock to the forepaw. Analysis of the
data so obtained shows that there are peculiar features in the nature of changes in
electrical activity of the motor and acoustic cortex in response to the action of
signal stimuli, which indicate that individual layers of the cortex of afferent and
efferent links of the conditioned reflex participate to a different degree in effecting
the conditioned connection.

Rabinovick, M. Ya.

New tannin for white leather. Ya. P. Berkman, L. Shuter, and M. Ya. Rabinovich. Legkaya Prom. 14, No. 7, 26-8(1954).—The new tannin "sulfone white" is made as follows: (1) prep. bis(4-hydroxyphenyl) sulfone (I) by heating phenol and $H_2SO_4$ at elevated temp., (2) crystallize I from aq. soln., (3) condense I with HCHO, and (4) condense the sulfone resin with HCHO and $Na_2SO_3$. Chem. characteristics of the tannin are similar to phenol syntans; it tans in acid medium, and approaches vegetable tannins in firming and filling capacity. It can be used in combination with other types of tannins.   B. Z. Kamich

RABINOVICH, M. Ya,
    BERKMAN, Ya.P.; SHUTER, L.; RABINOVICH, M.Ya.

    New tanning material for white leather. Leg.prom. 14 no.7:26-28
    Jl '54.                                            (MLRA 7:7)
        (Tanning)

KOVTUNOVICH, S.D., inzhener;  RABINOVICH, M.Ya., inzhener.

Combined deliming, softening, pickling and chrome tanning.  Leg.
prom. 16 no.5:46-47 My '56.                              (MLRA 9:8)
                     (Lvov--Leather industry)

RABINOVICH, M.Ya.; CHERNOMAZ, A.Ye.; OSTROVSKIY, M.M., KARANKEVICH, I.F.

Device for applying an acrylin coating on leather and for subsequent drying. Obm. tekh. opyt. [MLP] no.29:23-25 '57.
(MIRA 13:1)

(Leather industry--Equipment and supplies)

RABINOVICH, M.Ya.; CHERNOMAZ, A.Ye.; OSTROVSKIY, M.M.; KARANKEVICH, I.F.

Infrared rays for drying of leather. Obn. tekh. opyt. [MLP]
no.29:25-26  '57.                                (MIRA 13:1)
    (Infrared rays--Industry application)  (Leather--Drying)

RABINOVICH, M.Ya.

Ways of improving the quality of leather manufactured from
imported goat skins. Kozh.-obuv.prom. 4 no.1:36 Ja '62.
(MIRA 15:3)

(Hides and skins)

28(4)

AUTHORS:       Malkin, B. M., Rabinovich, M. Ya.        SOV/32-25-9-41/53

TITLE:         Unit for the Repeated Hardening of Samples

PERIODICAL:    Zavodskaya laboratoriya, 1959, Vol 25, Nr 9, pp 1133-1134 (USSR)

ABSTRACT:      In order to investigate the operating characteristics
               (dimension changes, changes of the surface purity, etc.) of
               details which are designed for a casting under pressure, as
               well as of molds which work under high temperatures, a unit for
               the repeated hardening of the samples was developed (Fig 1).
               On the basis of a graph, a description of the system is given.
               The unit also has a mechanism for transferring the sample
               from one medium into the other, i.e., for the heating or
               cooling, making possible an automatic control of the heating
               period and of the number of repetitions of the heating or
               cooling process. There are 2 figures.

Card 1/1